

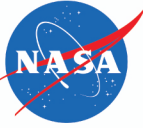
ATMOSPHERIC SCIENCE DATA CENTER STATUS

Jonathan Gleason
ASDC

CERES Science Team Meeting
Oct 29, 2013

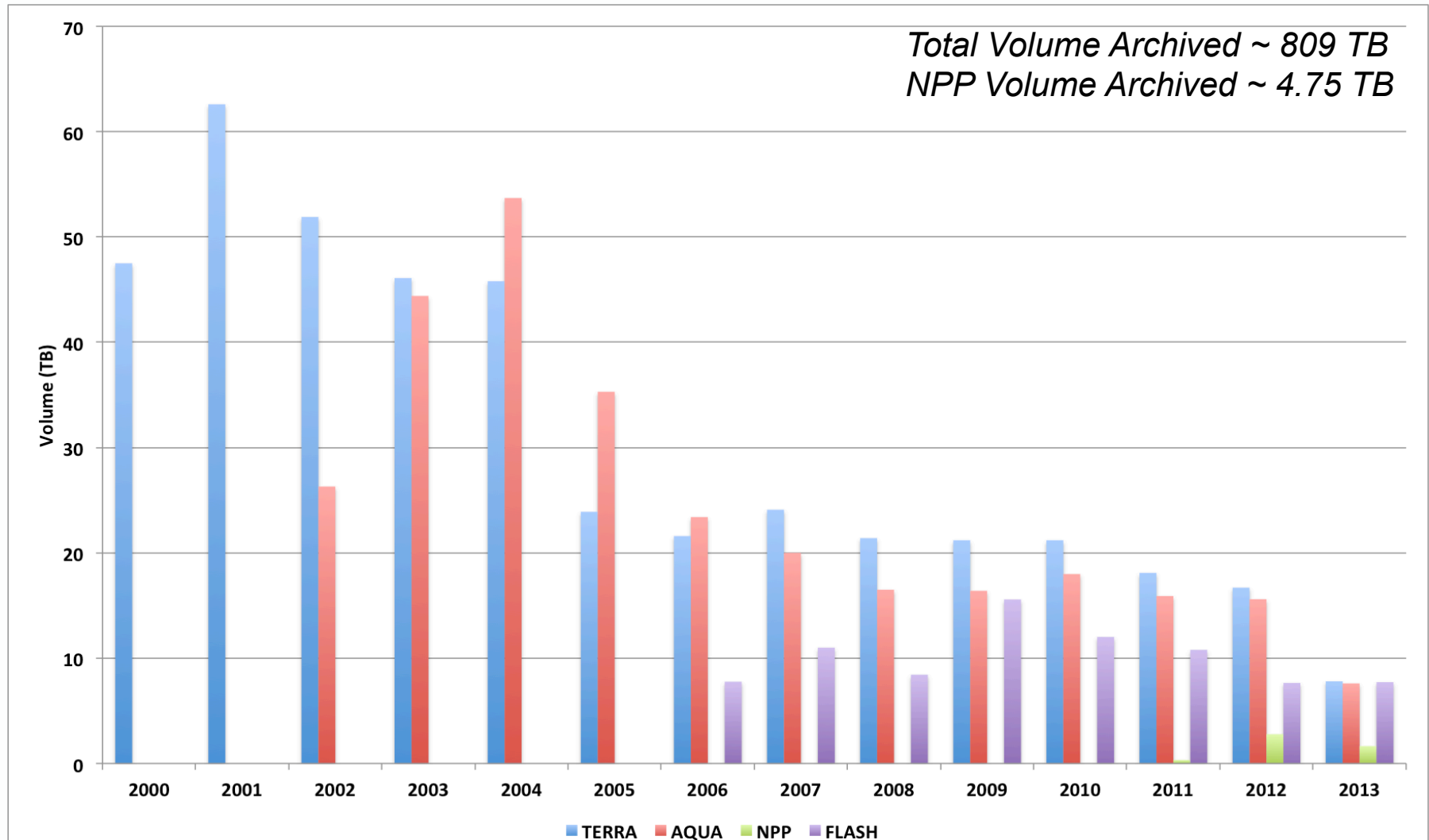


CERES USER METRICS



CERES and FLASHFlux Archive Volume

By Data Date Through September 2013

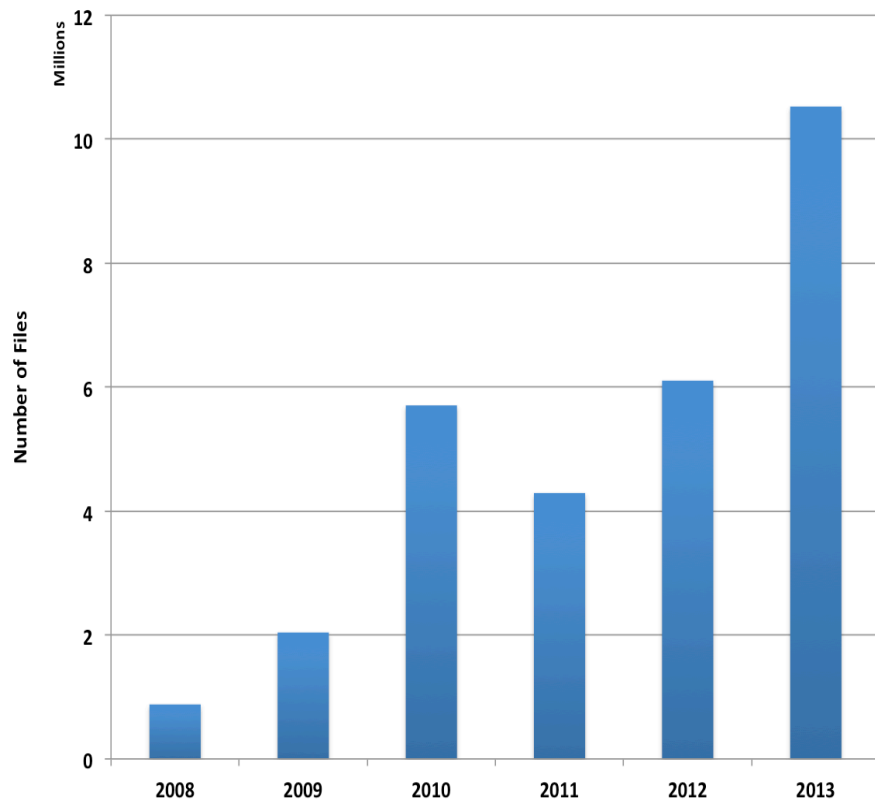




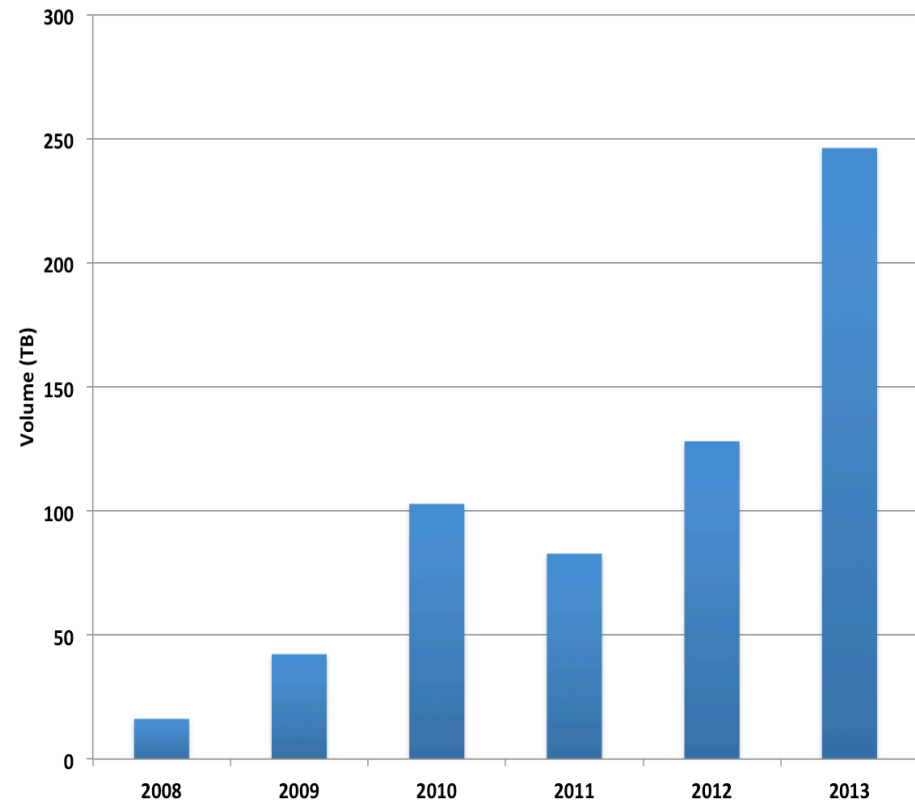
CERES Ancillary Data Archived

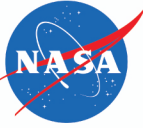
(September 2008 – September 2013)

CERES Production



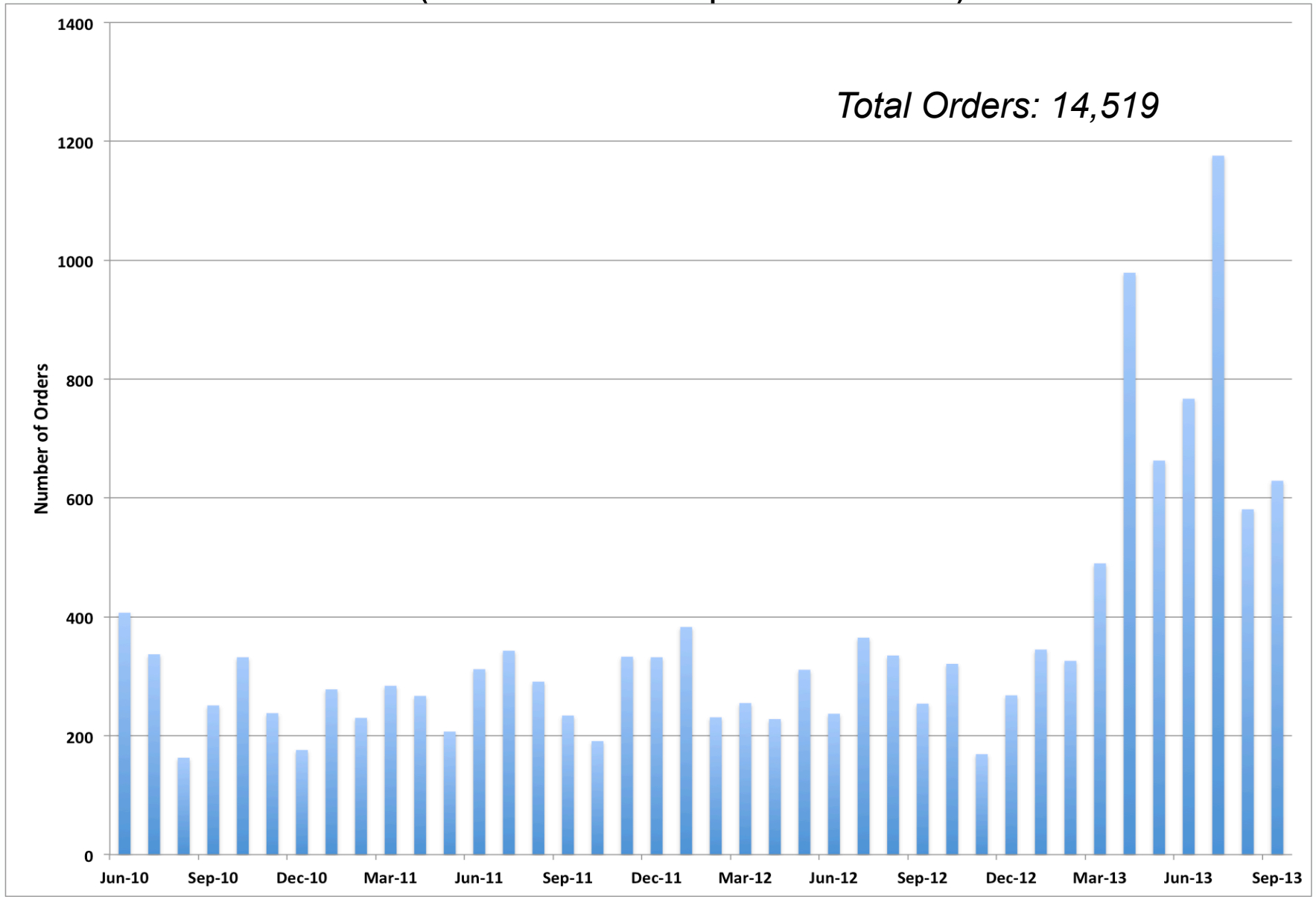
CERES Production





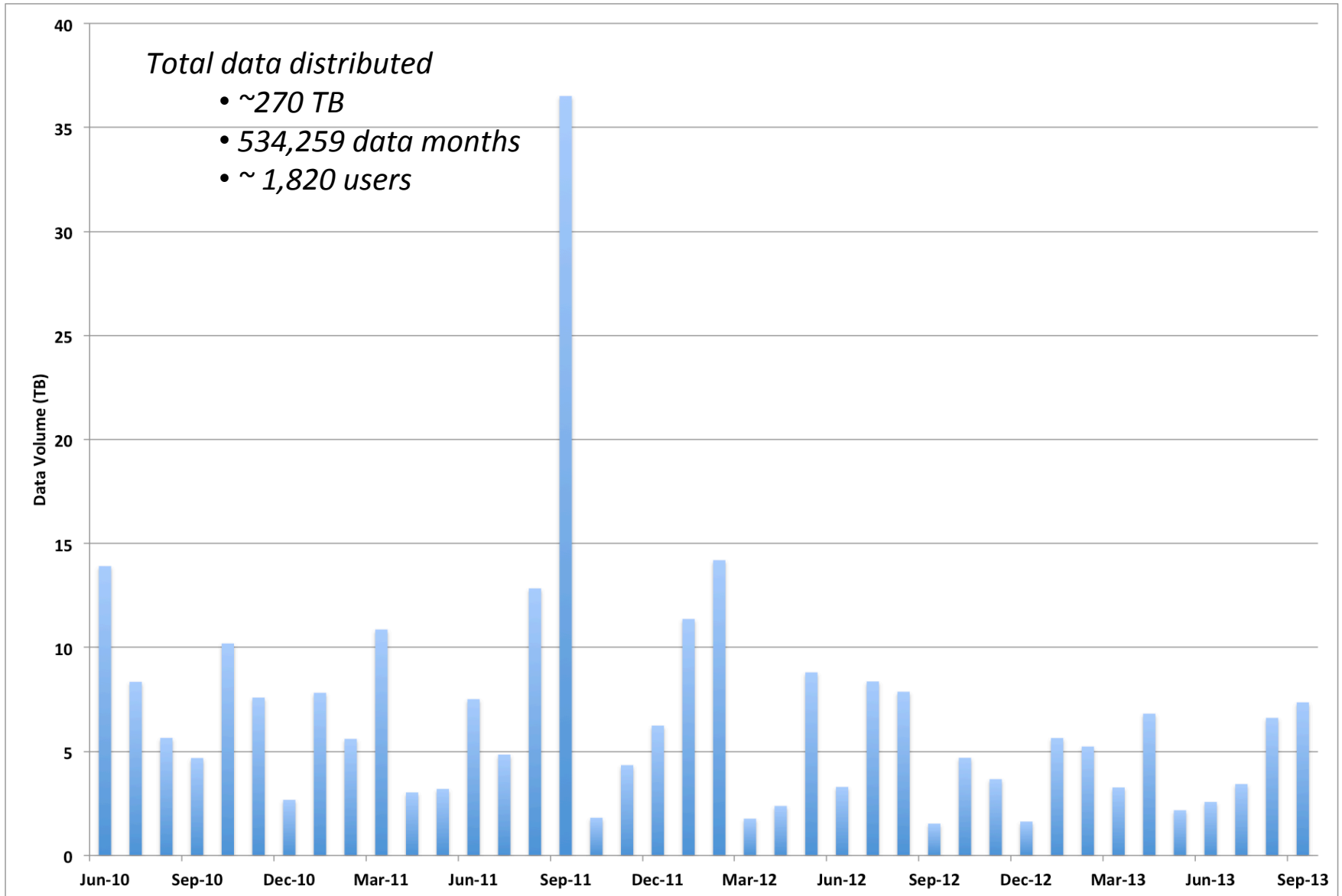
CERES Data Orders

(June 2010 – September 2013)



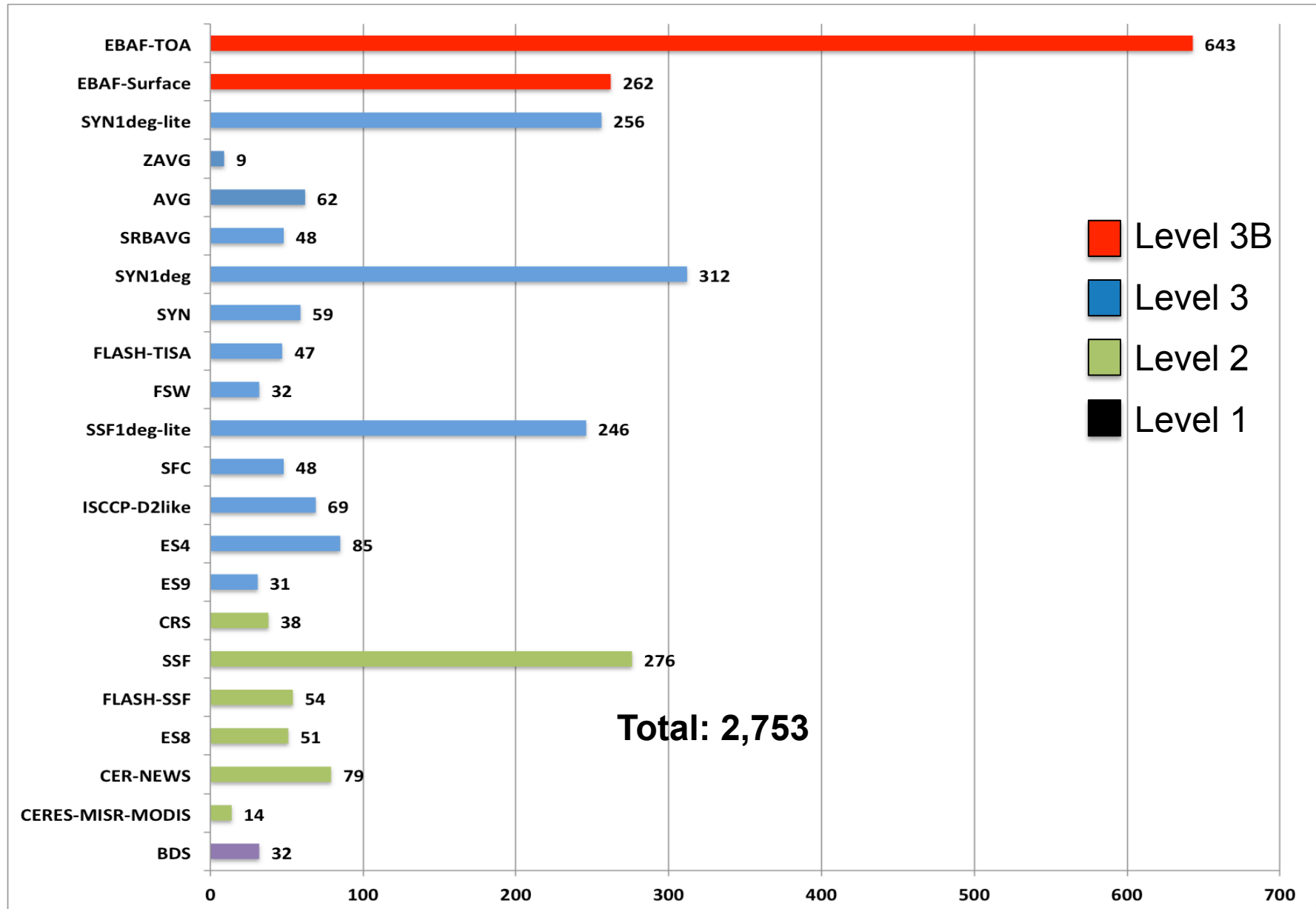
CERES Data Distribution

(June 2010 – September 2013)

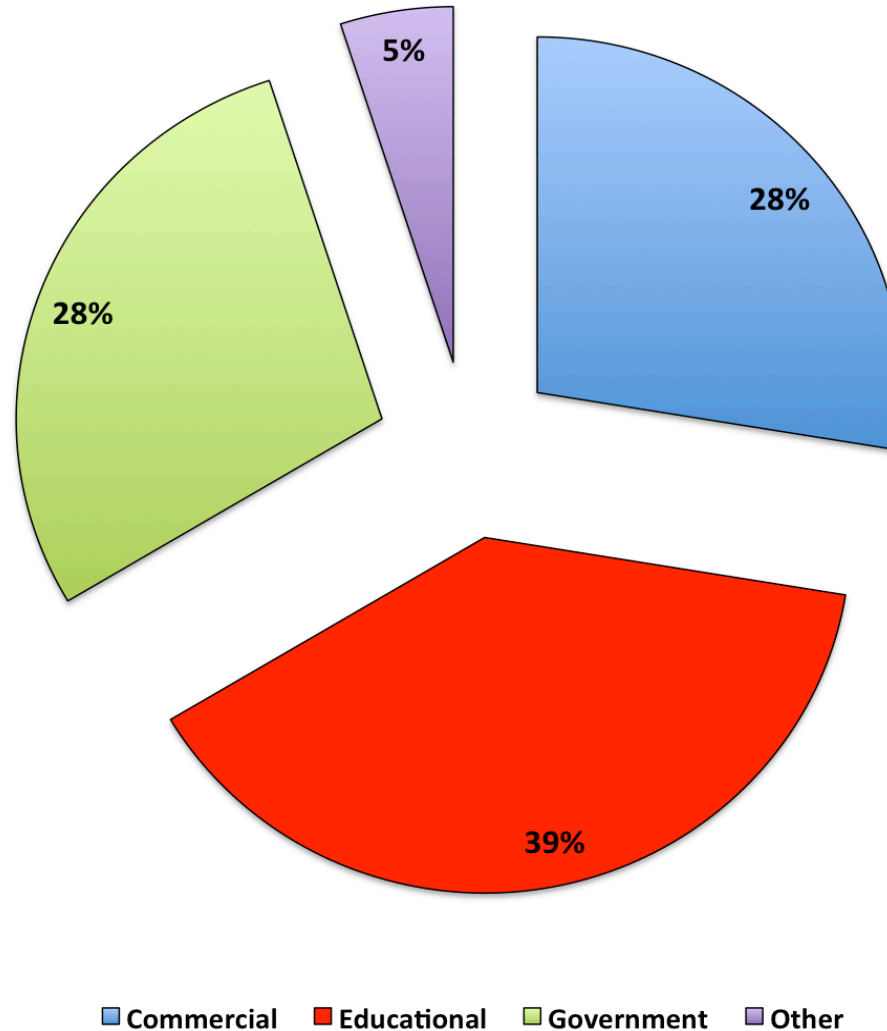


Number of Users by Product

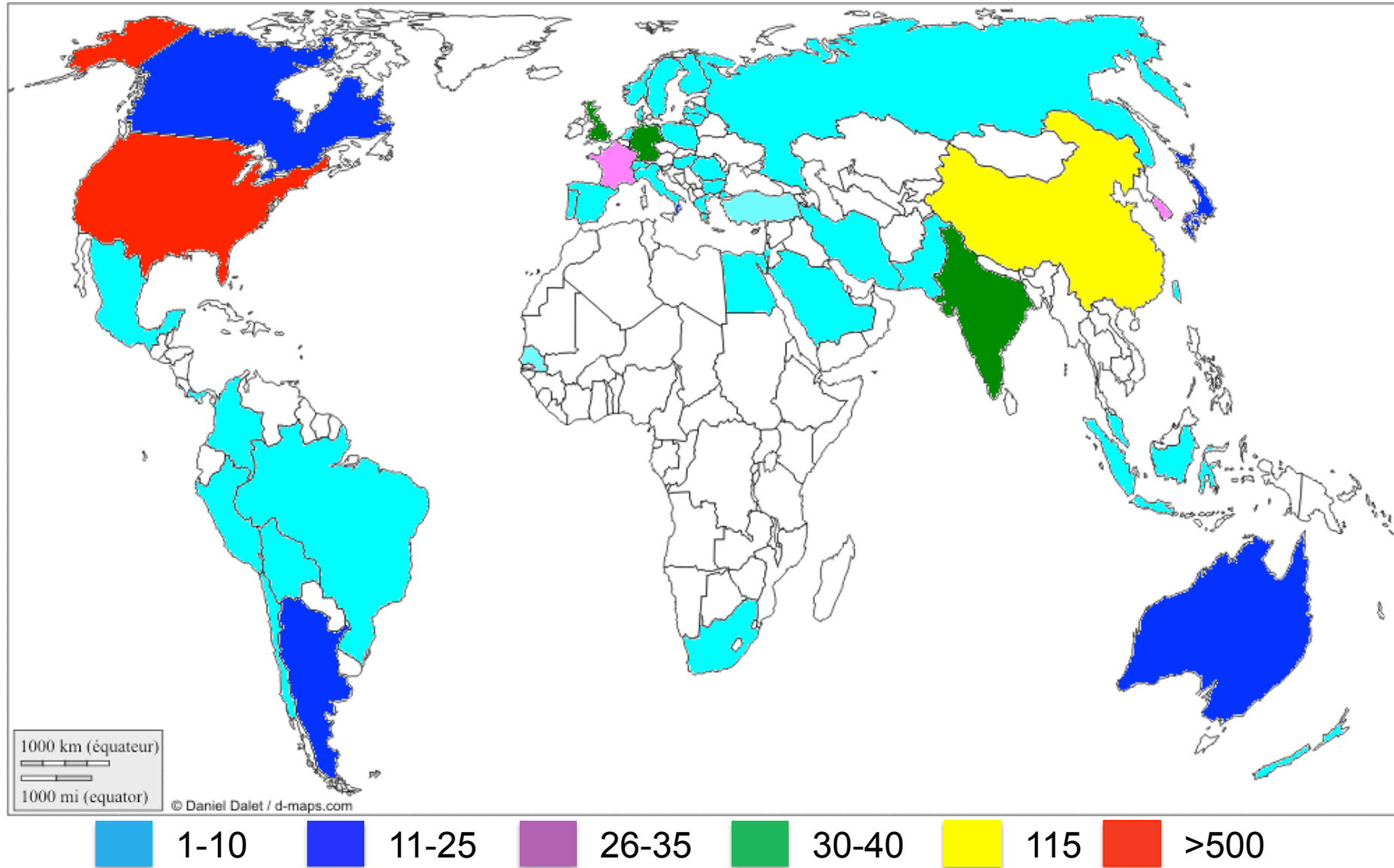
(June 2010 – September 2013)



User Affiliations

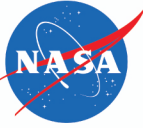


Users by Country (June 2010 – September 2013)

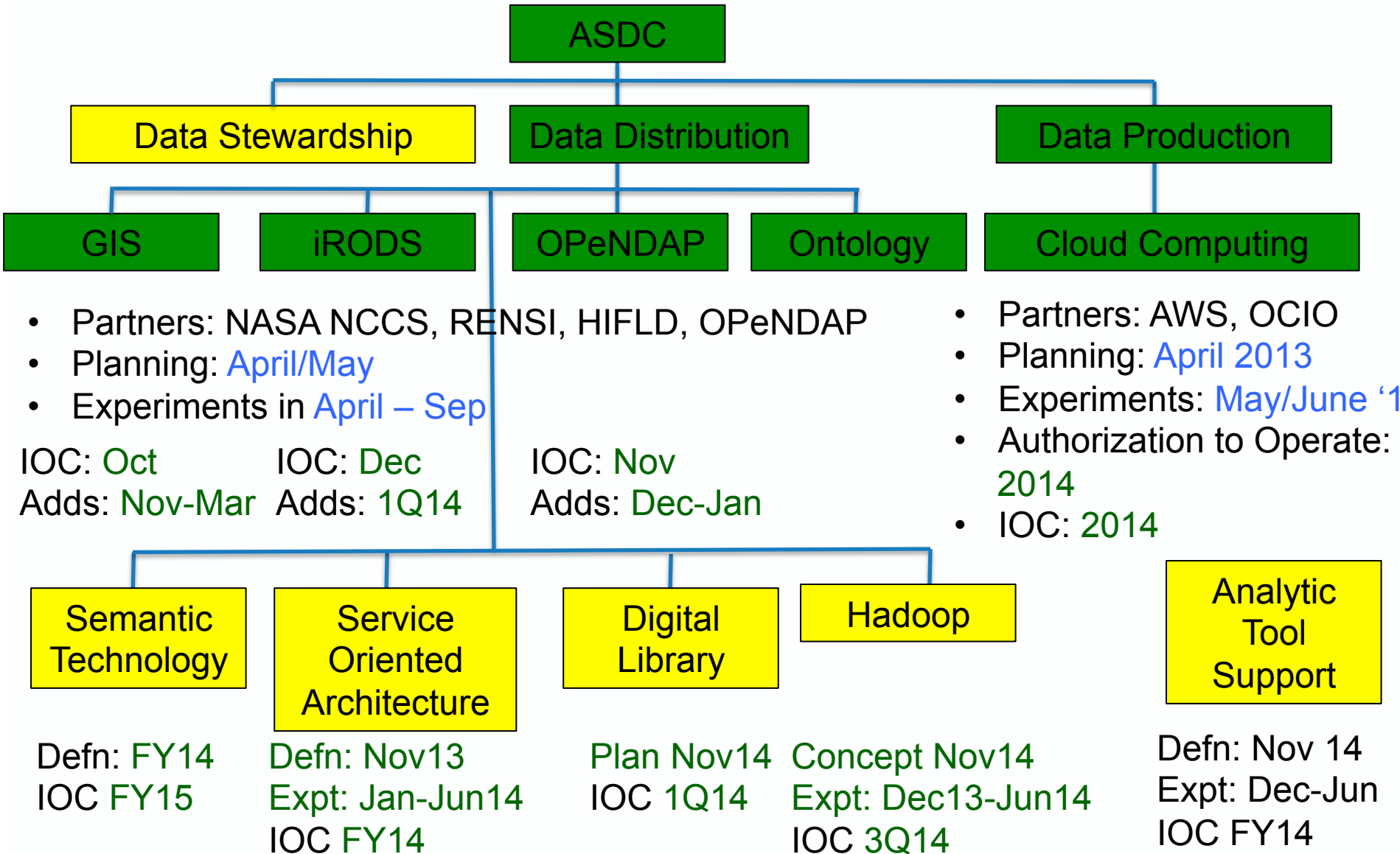




PLANNED DATA ACCESS IMPROVEMENTS

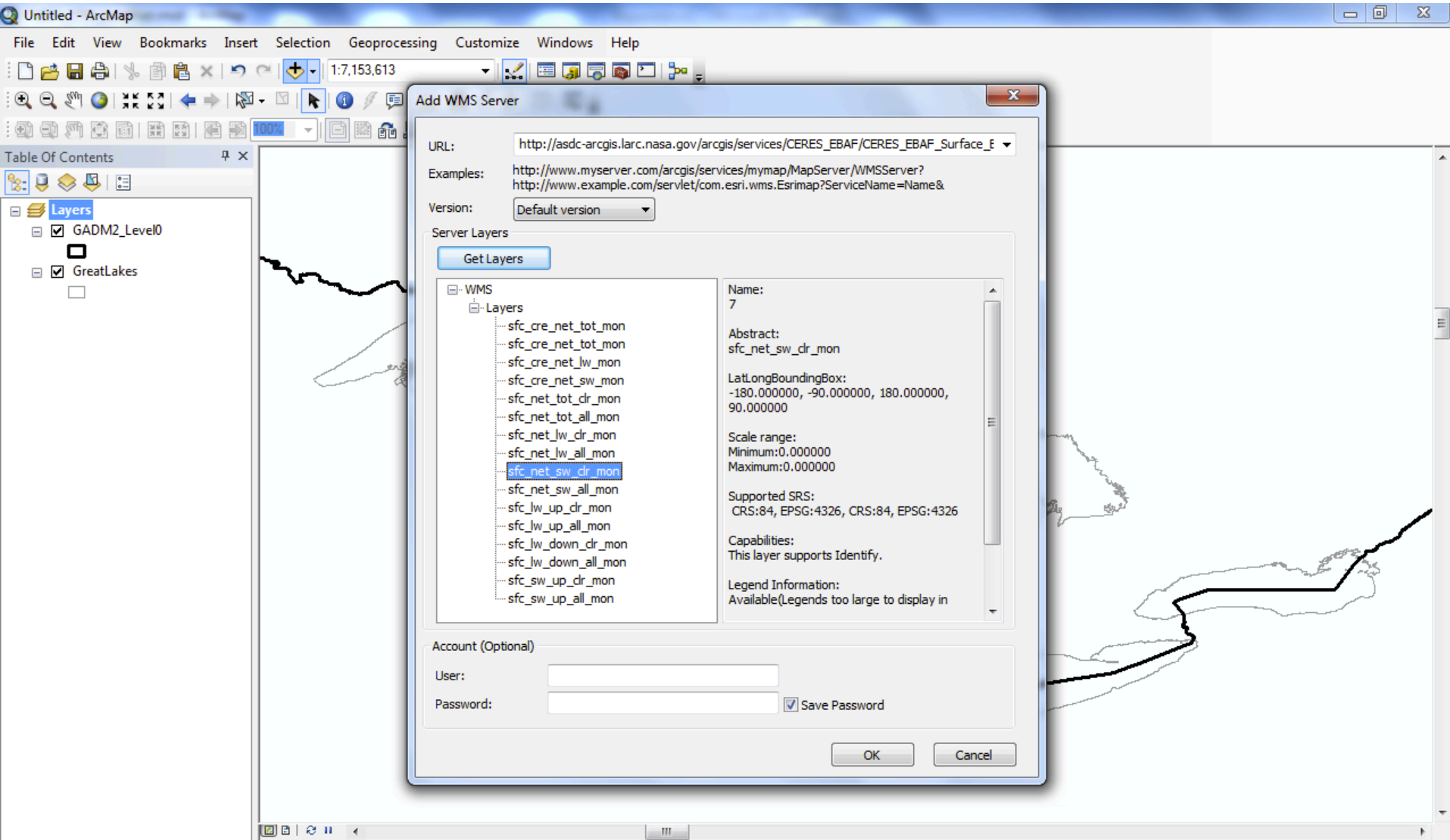


ASDC Areas of Modernization





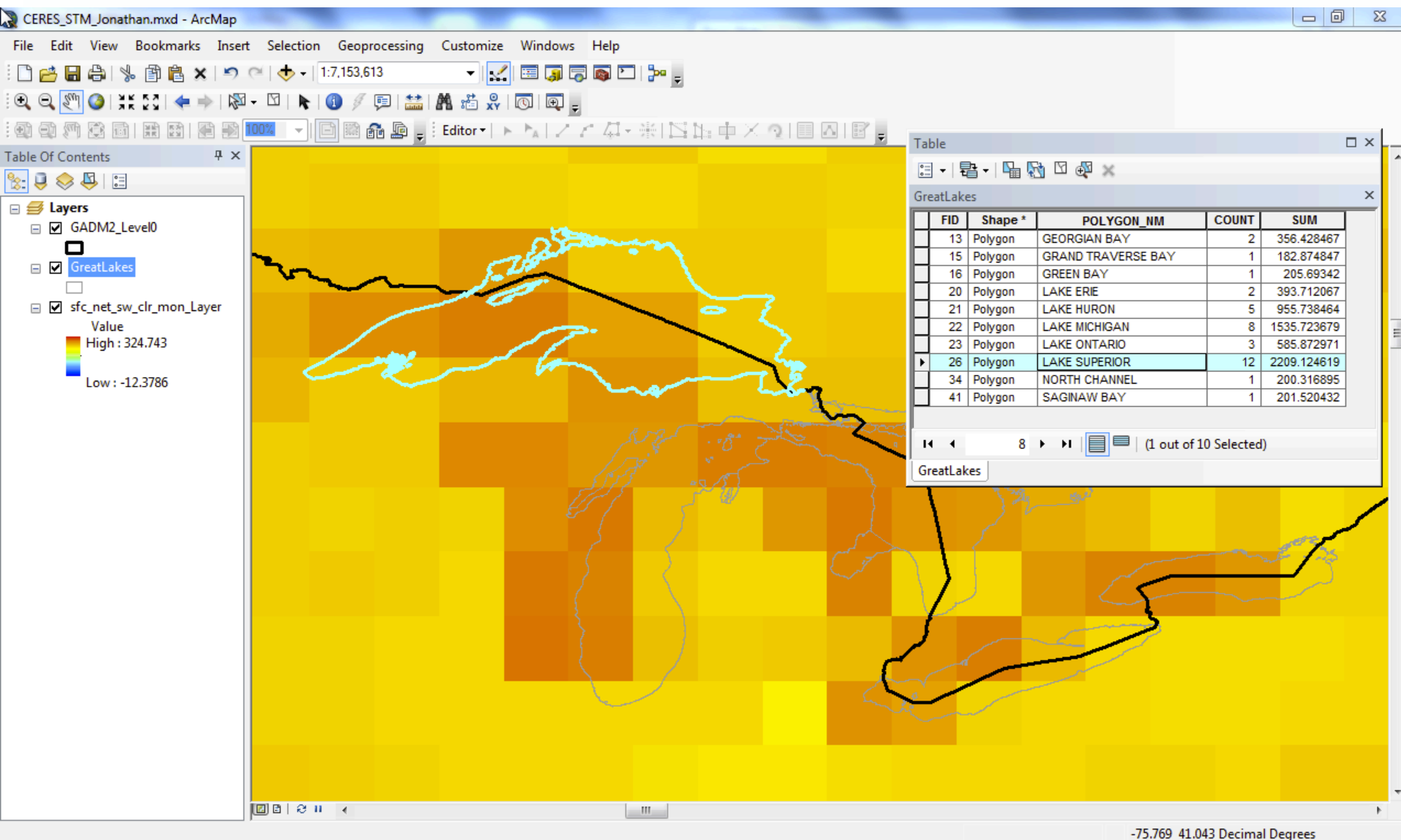
GIS Initial Capability – Using ArcGIS software and EBAF Surface Data





Possible GIS Use Case

CERES Surface Flux with Freshwater Lakes





LaRC Cloud Computing Scenarios

ASDC Data Product Re-processing

- Current approach: Buy extra hardware
- Bursty behavior
- High Data Throughput

Foreign National short-term Visitors and remote partners

- Current approach: NIA or company provisioning and Duplicate Data
- Irregular visitors, local hardware is often inadequate
- Permit their sponsor to buy time Public Cloud without NASA participation
 - Permit NASA funded option depending on agreement with sponsor
- NASA makes public data available to their cloud instance
- Continue collaboration on non-NASA assets after they return home



ASDC EOSWEB RE-DESIGN EFFORT

eosweb.larc.nasa.gov



EOSWEB Re-design Effort

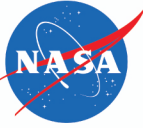
ASDC deployed new website April 8, 2013

Goal

- Enhance user experience for data discovery, ordering and external site access
- Improve sustainability for ASDC staff and science content providers. Drupal 7 Content Management System provides modularity and maintainability.

Stakeholder Input

- Incorporate features & best practices from ESDIS & other NASA DAACS
- ASDC User Working Group and CERES team engaged to provide input
- Project teams solicited and feedback successfully incorporated
- New design addresses findings from ESDIS GIBS study



EOSWEB Re-design Effort

Status

- Ongoing effort to incorporate enhancements to website
- Significant interaction with CERES team (Doelling, P. Mlynchzak, Loeb) since initial deployment to tailor data informational pages
- October 25th, 2013 deployment incorporates CERES updates

CERES Updates

- CERES data info pages reflect 4 tier design
 - Tier 1 – Level (1, 2, 3, 3b)
 - Tier 2 – Processing Stream Name
 - Tier 3 – Product Name
 - Tier 4 – Filename



October 25th CERES Updates

- Combined overlapping Terra/Aqua datasets into one webpage per stream (SYN1deg, ISCCP-D2-like, CRS)
- Updated temporal coverage to list date ranges per platform and per instrument for combined dataset
- Added Instrument and Platform fields for merged data products
- Added “Current Products” and “Legacy Versions” links were relevant
- Reorganize ES4/9 product pages to separate Edition3 from Ed1-CV and organize by platform
- Added capability to list product specific notes
- Added netCDF label to subset/visualization tool links
- Added ES4/9 links to NPP Data Products Page
- Implemented misc. corrections per feedback from CERES team



EOSWEB Re-design Effort

Tier 1 – Level
Each level contains streams

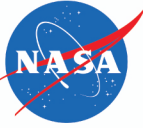
CERES Data and Information



The Clouds and the Earth's Radiant Energy System ([CERES](#)) is a key component of the Earth Observing System (EOS) program. The CERES instruments provide radiometric measurements of the Earth's atmosphere from three broadband channels. The CERES missions are a follow-on to the successful Earth Radiation Budget Experiment ([ERBE](#)) mission. The first CERES instrument (PFM) was launched on November 27, 1997 as part of the Tropical Rainfall Measuring Mission (TRMM). Two CERES instruments (FM1 and FM2) were launched into polar orbit on board the EOS flagship Terra on December 18, 1999. Two additional CERES instruments (FM3 and FM4) were launched on board EOS Aqua on May 4, 2002. The newest CERES instrument (FM5) was launched on board the Suomi National Polar-orbiting Partnership (NPP) satellite on October 28, 2011.

Level 3B **Level 3** **Level 2** **Level 1B** **Documentation**

- Level 3 Description
- SYN1deg - CERES temporally interpolated TOA fluxes (GEO-enhanced), MODIS and GEO clouds, and computed TOA/surface/profile fluxes
- SSF1deg - CERES temporally interpolated TOA fluxes (constant meteorology) and MODIS clouds.
- ISCCP-D2like - CERES-MODIS and GEO cloud properties stratified by ISCCP cloud types.
- FLASHFlux - Near real-time CERES observed TOA fluxes, MODIS clouds, and parameterized surface fluxes, not officially calibrated.
- ERBElike - CERES instrument TOA fluxes using algorithms identical to those used by ERBE.



EOSWEB Re-design Effort

Tier 2 – Stream

Each stream contains data products. Products organized by temporal and spatial resolution vs by filenames

▼ SYN1deg - CERES temporally interpolated TOA fluxes (GEO-enhanced), MODIS and GEO clouds, and computed TOA/surface/profile fluxes

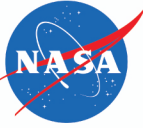
▼ Current Products

Description: CERES temporally interpolated TOA fluxes (GEO-enhanced), MODIS and GEO clouds, and computed TOA/surface/profile fluxes.

| Products | Temporal Resolution | Spatial Resolution | Temporal Coverage |
|-------------------------------------|---------------------|-------------------------|---|
| SYN1deg-Month Ed3A | Monthly | Regional, Zonal, Global | Terra: 03/2000 - 06/2002 Terra+Aqua: 07/2002 - 03/2013 |
| SYN1deg-Day Ed3A | Daily | Regional | 03/2000 - 03/2012 |
| SYN1deg-M3Hour Ed3A | Monthly 3-Hourly | Regional, Zonal, Global | Terra: 03/2000 - 06/2002 Terra+Aqua: 07/2002 - 03/2013 |
| SYN1deg-3Hour Ed3A | 3 Hourly | Regional, Zonal, Global | Terra: 03/2000 - 06/2002 Terra+Aqua: 07/2002 - 03/2013 |

► Legacy Versions

Legacy versions listed by filename



EOSWEB Re-design Effort

Tier 3 – Data Product

Each product contains detailed product info

SYN1deg-Month Ed3A

Project Title: CERES
Discipline: [Clouds](#)
[Radiation Budget](#)
Version: Edition 3A
Level: L3
Platform: Terra, Aqua
Spatial Coverage: (-90, 90)(-180, 180)
Spatial Resolution: Regional, Zonal, Global
Temporal Coverage: Terra: 03/2000 - 06/2002
Terra+Aqua: 07/2002 - 03/2013
Temporal Resolution: Monthly
File Format: HDF

Reverb: [Order Data](#)

Subset/Visualization Tool: [CERES Order Tool](#) (netCDF)

Quality Summary: [SYN1deg Ed3A Quality Summary](#)



Temporal coverage shows both ranges in merged dataset

[Browse Images](#)

[Parameters](#)

[Order Data](#)

[Read Software](#)

[Documentation](#)

[CERES Browse Imagery](#)

Shorter terms used to describe products vs detailed filename


Tier 4 – Filenames

Order Files From REVERB Website (Outside EOSWEB)

Spatial Search [?]

Bounding Box

Satellite



Click and drag to set a bounding rectangle

Search by ESRI shape file

Step 2: Select Datasets [?]

Found 2 datasets. Total Query Time: 0.03s

☒ CER_SYN1deg-Month_Terra-Aqua-MODIS_Edition3A
Archive Center: Atmospheric Science Data Center Short Name: CER_SYN1deg-Month_Terra-Aqua-MODIS_Edition3A Version: 3A

☒ CER_SYN1deg-Month_Terra-MODIS_Edition3A
Archive Center: Atmospheric Science Data Center Short Name: CER_SYN1deg-Month_Terra-MODIS_Edition3A Version: 3A

Search Terms [?]

Temporal Search [?]

START

END

* all times must be specified in GMT

Date Range


Annual Repeating Dates

Both filename types (Terra and Terra+Aqua) appear in search

EOSWEB Updates



Overlapping Terra & Aqua datasets combined for display at stream level




Atmospheric
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at the NASA Langley Research Center

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CERES Data and Information



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[Level 3B](#) [Level 3](#) [Level 2](#) [Level 1B](#) [Documentation](#)

Level 3 Description

SYN1deg - CERES temporally interpolated TOA fluxes (GEO-enhanced), MODIS and GEO clouds, and computed TOA/surface/profile fluxes

Current Products

Description: CERES temporally interpolated TOA fluxes (GEO-enhanced), MODIS and GEO clouds, and computed TOA/surface /profile fluxes.

| Products | Temporal Resolution | Spatial Resolution | Temporal Coverage |
|-------------------------------------|---------------------|-------------------------|---|
| SYN1deg-Month Ed3A | Monthly | Regional, Zonal, Global | Terra: 03/2000 - 06/2002 Terra+Aqua: 07/2002 - 03/2013 |
| SYN1deg-Day Ed3A | Daily | Regional | 03/2000 - 03/2012 |
| SYN1deg-M3Hour Ed3A | Monthly 3-Hourly | Regional, Zonal, Global | Terra: 03/2000 - 06/2002 Terra+Aqua: 07/2002 - 03/2013 |
| SYN1deg-3Hour Ed3A | 3 Hourly | Regional, Zonal, Global | Terra: 03/2000 - 06/2002 Terra+Aqua: 07/2002 - 03/2013 |


Legacy Versions

SSF1deg - CERES temporally interpolated TOA fluxes (constant meteorology) and MODIS clouds.

ISCCP-D2like - CERES-MODIS and GEO cloud properties stratified by ISCCP cloud types.

FLASHFlux - Near real-time CERES observed TOA fluxes, MODIS clouds, and parameterized surface fluxes, not officially calibrated.

ERBElike - CERES instrument TOA fluxes using algorithms identical to those used by ERBE.




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CERES Data and Information



The Clouds and the Earth's Radiant Energy System (CERES) is a key component of the Earth Observing System (EOS) program. The CERES instruments provide radiometric measurements of the Earth's atmosphere from three broadband channels. The CERES missions are a follow-on to the successful Earth Radiation Budget Experiment (ERBE) mission. The first CERES instrument (PFM) was launched on November 27, 1997 as part of the Tropical Rainfall Measuring Mission (TRMM). Two CERES instruments (FM1 and FM2) were launched into polar orbit on board the EOS flagship Terra on December 18, 1999. Two additional CERES instruments (FM3 and FM4) were launched on board EOS Aqua on May 4, 2002. The newest CERES instrument (FM5) was launched on board the Suomi National Polar-orbiting Partnership (NPP) satellite on October 28, 2011.

[Level 3B](#) [Level 3](#) [Level 2](#) [Level 1B](#) [Documentation](#)

Level 3 Description

SYN1deg - CERES temporally interpolated TOA fluxes (GEO-enhanced), MODIS and GEO clouds, and computed TOA/surface/profile fluxes

SSF1deg - CERES temporally interpolated TOA fluxes (constant meteorology) and MODIS clouds.

ISCCP-D2like - CERES-MODIS and GEO cloud properties stratified by ISCCP cloud types.

Description: CERES-MODIS and GEO cloud properties stratified by ISCCP cloud types and in the similar D2 format.
Merged: Terra + Aqua MODIS and 3-hourly geostationary cloud retrievals for daytime only.
GEO: 3-hourly geostationary-only cloud retrievals for daytime only.
Day/Nit: Single satellite MODIS-only cloud retrievals stratified by daytime and nighttime. Nighttime cloud retrievals are based on MODIS IR channels only and may not be of the same quality as the daytime retrievals.

| Products | Temporal Resolution | Spatial Resolution | Temporal Coverage |
|---|----------------------------|--------------------|---|
| ISCCP-D2like-Merged Ed2A | Monthly & Monthly 3-Hourly | Regional | 07/2002 - 06/2010 |
| ISCCP-D2like-GEO Ed2A | Monthly & Monthly 3-Hourly | Regional | 03/2000 - 02/2010 |
| ISCCP-D2like-Day Terra Ed2A | Monthly & Monthly 3-Hourly | Regional | 03/2000 - 06/2010 (combining FM1 and FM2 files) |
| ISCCP-D2like-Nit Terra Ed2A | Monthly & Monthly 3-Hourly | Regional | 03/2000 - 06/2010 (combining FM1 and FM2 files) |

FLASHFlux - Near real-time CERES observed TOA fluxes, MODIS clouds, and parameterized surface fluxes, not officially calibrated.

ERBElike - CERES instrument TOA fluxes using algorithms identical to those used by ERBE.

SYN1deg

ISCCP-D2Like

<http://eosweb.larc.nasa.gov>

October 29, 2013

ASDC Update for CERES STM

Page: 23



EOSWEB Updates

Added platform (L3) and instrument (L2 & L3) fields for merged product-level pages

SSF Aqua-FM3 Ed3A

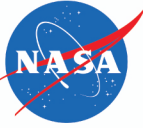
| | | | |
|---|----------------------------------|----------------------------|--|
| Project Title: | CERES | Reverb: | Order Data |
| Discipline: | Clouds | Subset/Visualization Tool: | CERES Order Tool (netCDF) |
| | Radiation Budget | Quality Summary: | Aqua Edition3A Quality Summary |
| Version: | Edition 3A | | |
| Level: | L2 | | |
| Platform: | Aqua | | |
| Instrument: | FM3 | | |
| Spatial Coverage: | (-90, 90)(-180, 180) | | |
| Spatial Resolution: | Footprint | | |
| Temporal Coverage: | 07/02/2002 - 04/30/2013 | | |
| Temporal Resolution: | Instantaneous | | |
| File Format: | HDF | | |
| Browse Images Parameters Order Data Read Software Documentation | | | |

[CERES Browse Imagery](#)

SYN1deg-3Hour Ed3A


| | | | |
|---|----------------------------------|----------------------------|--|
| Project Title: | CERES | Reverb: | Order Data |
| Discipline: | Clouds | Subset/Visualization Tool: | CERES Order Tool (netCDF) |
| | Radiation Budget | Quality Summary: | SYN1deg Ed3A Quality Summary |
| Version: | Edition 3A | | |
| Level: | L3 | | |
| Platform: | Terra, Aqua | | |
| Spatial Coverage: | (-90, 90)(-180, 180) | | |
| Spatial Resolution: | Regional, Zonal, Global | | |
| Temporal Coverage: | Terra: 03/2000 - 06/2002 | | |
| | Terra+Aqua: 07/2002 - 03/2013 | | |
| Temporal Resolution: | 3 Hourly | | |
| File Format: | HDF | | |
| Browse Images Parameters Order Data Read Software Documentation | | | |

[CERES Browse Imagery](#)



EOSWEB Updates

Added “Current Products” and “Legacy Versions” links



Atmospheric Science Data Center

[Home](#) [Data Descriptions](#) [Order Data](#) [Citing ASDC Data](#) [Help & Resources](#)

CERES Data and Information

The Clouds and the Earth's Radiant Energy System (CERES) is a key component of the Earth Radiation Budget Experiment (ERBE) mission. The first CERES instrument was launched on the Tropical Rainfall Measuring Mission (TRMM). Two CERES instruments (FM1 and FM2) were launched into orbit on the Earth Radiation Budget Satellite (ERBS). Additional CERES instruments (FM3 and FM4) were launched on board EOS Aqua on May 24, 2002. The Suomi National Polar-orbiting Partnership (NPP) satellite on October 28, 2011.

Level 3B **Level 3** **Level 2** **Level 1B** **Documentation**

Level 3 Description

Spatially (1°x1° lat/lon regional, 1° zonal, global) and temporally (daily, monthly, etc.) averaged fluxes and clouds.

SYN1deg - CERES temporally interpolated TOA fluxes (GEO-enhanced), MODIS and GEO clouds, and computed TOA/surface/profile fluxes

Current Products

Legacy Versions

SSF1deg - CERES temporally interpolated TOA fluxes (constant meteorology) and MODIS clouds.

Current Products

Legacy Versions

ISCCP-D2like - CERES-MODIS and GEO cloud properties stratified by ISCCP cloud types.

FLASHFlux - Near real-time CERES observed TOA fluxes, MODIS clouds, and parameterized surface fluxes, not officially calibrated.

Current Products

Legacy Versions

ERBElike - CERES instrument TOA fluxes using algorithms identical to those used by ERBE.

ES4

Current Products

Legacy Versions

ES9

Level 3B **Level 3** **Level 2** **Level 1B** **Documentation**

Level 3 Description

SYN1deg - CERES temporally interpolated TOA fluxes (GEO-enhanced), MODIS and GEO clouds, and computed TOA/surface/profile fluxes

Current Products

Description: CERES temporally interpolated TOA fluxes (GEO-enhanced) and profile fluxes.

| Products | Temporal Resolution | Spatial Resolution |
|---------------------|---------------------|--------------------|
| SYN1deg-Month Ed3A | Monthly | Regional |
| SYN1deg-Day Ed3A | Daily | Regional |
| SYN1deg-M3Hour Ed3A | Monthly 3-Hourly | Regional |
| SYN1deg-3Hour Ed3A | 3 Hourly | Regional |

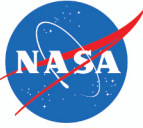
Legacy Versions

SSF1deg - CERES temporally interpolated TOA fluxes (constant meteorology) and MODIS clouds.

ISCCP-D2like - CERES-MODIS and GEO cloud properties stratified by ISCCP cloud types.

FLASHFlux - Near real-time CERES observed TOA fluxes, MODIS clouds, and parameterized surface fluxes, not officially calibrated.

ERBElike - CERES instrument TOA fluxes using algorithms identical to those used by ERBE.



EOSWEB Updates

ES4 & ES9 pages separate Ed3 and Cal/Val products

Level 3B Level 3 Level 2 Level 1B Documentation

Level 3 Description

- Spatially (1°x1° lat/lon regional, 1° zonal, global) and temporally (daily, monthly, etc.) averaged fluxes and clouds.
- SYN1deg - CERES temporally interpolated TOA fluxes (GEO-enhanced), MODIS and GEO clouds, and computed TOA/surface/profile fluxes
- SSF1deg - CERES temporally interpolated TOA fluxes (constant meteorology) and MODIS clouds.
- ISCCP-D2like - CERES-MODIS and GEO cloud properties stratified by ISCCP cloud types.
- FLASHFlux - Near real-time CERES observed TOA fluxes, MODIS clouds, and parameterized surface fluxes, not officially calibrated.
- ERBELike - CERES instrument TOA fluxes using algorithms identical to those used by ERBE.

ES4

Current Products

Description: ERBELike Monthly Geographic Averages (ES-4): CERES instrument TOA fluxes using algorithms identical to those used by ERBE, averaged regionally (2.5°, 5°, and 10° grid), zonally (2.5°, 5°, and 10°) and globally.
Note: The latest CERES data products (Edition3 for Terra and Aqua; Edition2 for TRMM) are approved for science publications.

| Products | Temporal Resolution | Spatial Resolution | Temporal Coverage |
|--------------------|--------------------------------|-------------------------|-------------------|
| ES4 Aqua-Xtrk Ed3 | Monthly, Daily, Monthly Hourly | Regional, Zonal, Global | 07/2002 - 03/2013 |
| ES4 Terra-Xtrk Ed3 | Monthly, Daily, Monthly Hourly | Regional, Zonal, Global | 03/2000 - 03/2013 |
| ES4 TRMM-PFM Ed2 | Monthly, Daily, Monthly Hourly | Regional, Zonal, Global | 01/1998 - 03/2000 |

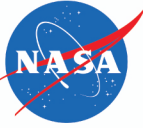
Note: Edition1-CV is for instrument validation purposes only and not suited for science publications.

| Products | Temporal Resolution | Spatial Resolution | Temporal Coverage |
|----------------------|--------------------------------|-------------------------|-------------------|
| ES4 Aqua-FM3 Ed1-CV | Monthly, Daily, Monthly Hourly | Regional, Zonal, Global | 07/2002 - 09/2013 |
| ES4 Aqua-FM4 Ed1-CV | Monthly, Daily, Monthly Hourly | Regional, Zonal, Global | 06/2002 - 03/2005 |
| ES4 NPP-FM5 Ed1-CV | Monthly, Daily, Monthly Hourly | Regional, Zonal, Global | 02/2012 - 09/2013 |
| ES4 Terra-FM1 Ed1-CV | Monthly, Daily, Monthly Hourly | Regional, Zonal, Global | 03/2000 - 09/2013 |
| ES4 Terra-FM2 Ed1-CV | Monthly, Daily, Monthly Hourly | Regional, Zonal, Global | 03/2000 - 09/2013 |

Legacy Versions

ES9

Products split by
Ed3 and Ed1-CV



EOSWEB Updates

Added “Product Note” field and clearly labeled CERES subset tool with “netCDF”

SYN1deg-Day Ed3A

Project Title: CERES
Discipline: Clouds
Radiation Budget
Version: Edition 3A
Level: L3
Spatial Coverage: (-90, 90)(-180,180)
Spatial Resolution: Regional
Temporal Coverage: 03/2000 - 03/2012
Temporal Resolution: Daily
File Format: NETCDF

CERES Order Tool: **Order Data** (netCDF)

Quality Summary: [SYN1deg Ed3A Quality Summary](#)

Product Note:

Daily averages available in netCDF from this tool; otherwise user can estimate the daily averages by using the SYN1deg-3Hour product.

[Browse Images](#)

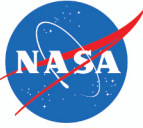
[Parameters](#)

[Order Data](#)

[Documentation](#)


[CERES Browse Imagery](#)

<http://eosweb.larc.nasa.gov>



EOSWEB Updates

Added ES4 & ES9 to NPP Products page



Atmospheric Science Data Center

Processing, archiving and distributing Earth science data at the NASA Langley Research Center

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CERES NPP Data Products

The Clouds and the Earth's Radiant Energy System (CERES) is a key component of the Earth Observing System (EOS) program. The CERES instruments provide radiometric measurements of the Earth's atmosphere from three broadband channels. The CERES missions are a follow-on to the successful Earth Radiation Budget Experiment (ERBE) mission. The first CERES instrument (PFM) was launched on November 27, 1997 as part of the Tropical Rainfall Measuring Mission (TRMM). Two CERES instruments (FM1 and FM2) were launched into polar orbit on board the EOS flagship Terra on December 18, 1999. Two additional CERES instruments (FM3 and FM4) were launched on board EOS Aqua on May 4, 2002. The newest CERES instrument (FM5) was launched on board the Suomi National Polar-orbiting Partnership (NPP) satellite on October 28, 2011.

[ERBElike NPP Data Products](#) [BDS NPP Data Products](#) [Documentation](#)

ERBElike Level 3 Data Products (ES-4 and ES-9)

ES-4

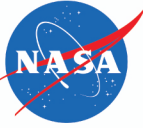
Description: ERBE-like Monthly Geographic Averages (ES-4): TOA fluxes using algorithms identical to those used by ERBE, averaged regionally (2.5°, 5°, and 10° grid), zonally (2.5°, 5°, and 10°) and globally.

Note: Edition1-CV is for instrument validation purposes only and not suited for science publications.

| Products | Temporal Resolution | Spatial Resolution | Temporal Coverage |
|------------------------------------|--------------------------------|-------------------------|-------------------|
| ES4 NPP-FM5 Ed1-CV | Monthly, Daily, Monthly Hourly | Regional, Zonal, Global | 02/2012 - 09/2013 |

ES-9

ERBElike Level 2 Data Products (ES-8)



Conclusion

- The ASDC continues to robustly support CERES ingest, archive, production, and distribution
- New alternative methods to file-level data access continue to be evaluated
 - “Get users the data the way they want it”
 - Potentially expand user community of CERES data
 - Cloud computing remains a possible model for future computing and data access needs
- Increased collaboration between ASDC and CERES team combined with new EOSWEB pages optimize CERES data discovery
 - Data info pages better guide users to appropriate product for user needs
 - New EOSWEB pages enable 4-Tier CERES data presentation

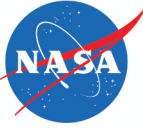


BACKUP CHARTS



LaRC Cloud Computing Scenarios

- **ASDC Data Product Re-processing**
 - Current approach: Buy extra hardware
 - Bursty behavior
 - High Data Throughput
- **Individual Principal Investigator on-demand computing**
 - Current approach: Buy small sets of hardware
 - Low duty cycle, infrequent usage
- **New Mission Science Data Processing**
 - Current approach: Buy dedicated or shared assets
 - Pre-launch mission processing runs out warranty
 - Compatibility with owned systems permits conversion when load warrants



LaRC Cloud Computing Scenarios

- Suborbital Missions
 - Current approach: Buy dedicated assets to take into field
 - Largely used only during field campaign (Bursty)
 - Remote Access is often difficult due to lack of connectivity
- Foreign National short-term Visitors and remote partners
 - Current approach: NIA or company provisioning and Duplicate Data
 - Irregular visitors, local hardware is often inadequate
 - Permit their sponsor to buy time Public Cloud without NASA participation
 - Permit NASA funded option depending on agreement with sponsor
 - NASA makes public data available to their cloud instance
 - Continue collaboration on non-NASA assets after they return home



ASDC Areas of Modernization (OLD)

